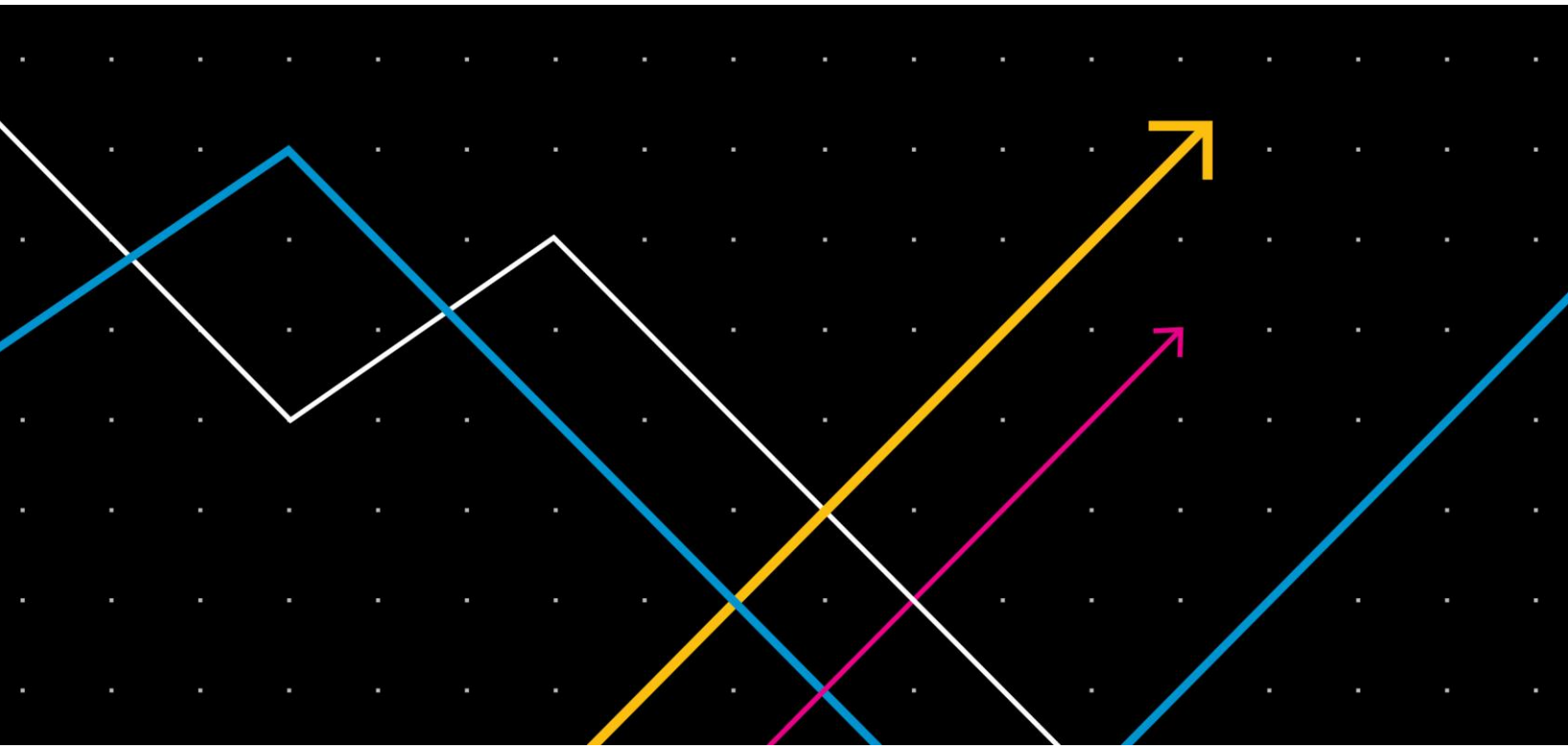

RESEARCH REPORT

The Effects of Statewide Private School Choice on College Enrollment and Graduation

Evidence from the Florida Tax Credit Scholarship Program

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September 2017 (updated December 2017)

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Acknowledgments

This report was funded by the Bill and Susan Oberndorf Foundation, the Walton Family Foundation, the Robertson Foundation, Kate and Bill Duhamel, the Foundation for Excellence in Education, and the Charles and Helen Schwab Foundation. We are grateful to them and to all our funders, who make it possible for Urban to advance its mission.

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We thank Kristin Blagg, Erica Blom, David Figlio, Cassandra Hart, Brian Kisida, Constance Lindsay, and Martin West for helpful comments on earlier drafts of this report. We also thank the Florida Department of Education (especially Eric Christesen and Tammy Duncan) and Step Up for Students (especially Dava Hankerson Fedrick) for sharing the data used in this study.

Executive Summary

Policies that allow students to use public dollars to attend private schools have increased rapidly in recent years. These private school choice programs include vouchers, tax credit scholarships, and education savings accounts. Over the past decade, the number of such programs has tripled, and the number of scholarships awarded has more than doubled from about 175,000 to more than 445,000 (EdChoice 2017).

Recent research on statewide private school choice programs in Indiana, Louisiana, and Ohio has found those programs have a negative effect on student test scores, at least in the early years of student participation. But little research exists on whether participating in a private school choice program affects long-term outcomes, such as college enrollment and degree attainment. Previous research on the long-term effects of private school choice programs has studied small programs, spanning no more than a single city.

This study is the first to examine the impact of a statewide private school choice program on enrollment in and graduation from college. We estimate the effects of the nation's largest private school choice program, the Florida Tax Credit (FTC) scholarship, on the rates at which students enroll in and graduate from public colleges and universities in Florida. We compare the outcomes of more than 10,000 low-income students who entered the program between 2004 and 2010 with outcomes of students with similar characteristics and test scores who never participated in the FTC program.

We find that participating in FTC has substantial positive impacts on the likelihood that students enroll in a public college in Florida. Participation in the FTC program increases college enrollment rates by 6 percentage points, or about 15 percent. Almost all of this effect occurs in community colleges (as opposed to four-year universities), which are more financially accessible to the low-income students participating in FTC and are where most Florida students begin their postsecondary education.

We find evidence of larger benefits for students who participate in the program for a greater number of years, with the largest impacts (up to 18 percentage points, a 43 percent increase) for students who spend four or more years as FTC students. This may be because students who benefit the most from the program also remain in the program the longest. Thirty-seven percent of FTC students participate in the program for only one year, and these students do not appear to benefit from the program.

These positive impacts on enrollment in community colleges are tempered by modest impacts on the share of students who earn associate degrees. This result is only partly explained by the fact that graduation rates of low-income students in community colleges are generally low.

We also provide evidence on the types of private elementary and secondary schools in the FTC program that are associated with the largest impacts on college enrollment. Catholic schools and non-Christian religious schools have higher estimated impacts on FTC students' college enrollment rates than non-Catholic Christian schools and nonreligious private schools. Schools where most students use FTC scholarships also had lower estimated enrollment impacts than schools that appear to depend less on the program (although the FTC program did not reduce overall college enrollment rates for any group of private schools we examine).

Our findings are limited because we only observe enrollment at public colleges in Florida, and national data indicate that low-income students from private high schools are more likely to enroll in private and out-of-state colleges than low-income students from public high schools. Because of this, our results may understate the true impact of FTC participation on college enrollment and degree attainment. But FTC students could also differ in unmeasured ways that bias our results.

This study finds that the nation's largest private school choice program helps get students into college, but too many still fail to earn degrees. A fuller understanding of what this means for these students will require continuing to track their outcomes, including bachelor's degree attainment rates and incomes. But this study shows that policymakers considering the design, expansion, or reform of private school choice programs should carefully consider not just their likely impact on short-term metrics such as test scores, but also how they might shape long-term outcomes, including college enrollment and graduation.

Errata

Appendix table A.9 was updated on December 5, 2017. The numbers in the original table reflected a calculation error. Trends and conclusions, however, remain the same.

Also, on page 24, we updated "appendix table A.9" to say "appendix table A.10," and on page 25, we updated "appendix table A.10" to say "appendix table A.9" so that readers are referred to the correct tables that support our in-text claims.

The Effects of Statewide Private School Choice on College Enrollment and Graduation

Private school choice is in the spotlight because of the appointment of a prominent advocate for school choice, Betsy DeVos, as US secretary of education, as well as efforts in statehouses around the country to expand publicly funded access to private schools through vouchers, tax credit scholarships, and education savings accounts.

Research on private school choice has focused largely on measuring the impact of attending a private school on students' test scores, relative to attending a public school. Until recently, this research showed neutral to positive effects of private school choice on student achievement (Egalite and Wolf 2016; Shakeel, Anderson, and Wolf 2016). But recent studies have found negative effects of participating in statewide private school choice programs in Indiana, Louisiana, and Ohio (Figlio and Karbownik 2016; Mills and Wolf 2017; Waddington and Berends 2017).[1] The Indiana and Louisiana studies find that negative effects are especially strong in the first year of student participation in the program and lessen over time in part because many students return to public schools.

Although test scores are an important measure of learning, they may miss important impacts, both positive and negative, that schools have on student development. Test scores may overstate the benefits associated with attending a school that focuses on teaching to the test at the expense of important student outcomes not measured by standardized tests. The opposite may also be true. Some schools may have positive impacts that are not adequately captured by standardized test performance. And test scores often cannot be used to measure policy effects in high schools, which usually do not administer annual tests.

Some studies that have examined the long-term impact of choice policies suggest larger impacts on high school graduation and college enrollment than the initial test score evidence might have suggested. For example, Wolf and coauthors' (2010) study of the Washington, DC, school voucher program found stronger evidence of effects on high school graduation rates than on test scores, with the offer of a voucher increasing graduation rates 12 percentage points.[2]

Nevertheless, the evidence on long-term impacts is limited, largely because it takes years for children to progress through the educational system to where their high school graduation, college

enrollment, and college graduation rates can be examined. The available high-quality evidence on the long-term impacts of private school choice is limited to a handful of studies, none of which examine statewide programs.

Evans and Schwab (1995) study naturally occurring variation in Catholic school attendance and find that attending a Catholic high school increases the chance that a student will complete high school or enroll at a four-year college by 13 percentage points. Chingos and Peterson (2015) examine the privately funded New York City voucher program and find that winning the scholarship lottery had no overall impact on college enrollment but had positive impacts for students of color and the children of women born in the US. Finally, Cowen and coauthors (2013) find that participants in the Milwaukee voucher program had higher rates of on-time high school graduation and four-year college enrollment than a matched sample of public school students.

This study is the first to examine the impact of participating in a statewide private school choice program on college enrollment and degree attainment. We estimate the impact of the Florida Tax Credit (FTC) scholarship program on participating students' enrollment in and graduation from public colleges and universities in Florida. The FTC program, which provides private school scholarships to more than 100,000 low-income students, is the largest voucher-type program in the country in terms of student enrollment.[3] We study FTC participants who began receiving scholarships between 2004–05 and 2010–11, and we can follow the earliest cohort of students included in the study for over a decade after their initial program participation.

We compare the postsecondary enrollment and attainment of FTC students to a matched sample of students who attended the same public schools as the FTC students (before their FTC participation) but never participated in the FTC program. Carefully tailoring the comparison group is important because the FTC program is targeted to low-income students, and other characteristics that vary systematically between FTC students and the comparison group may influence families' decisions to participate. We show that our results are robust to several changes to our primary matching strategy, but this methodology may not eliminate bias from student selection into the program.

We find that FTC participants were about 6 percentage points more likely to enroll in a Florida public college within two years of expected high school graduation than similar students who did not participate, an increase of about 15 percent. The effect of FTC is comparable for students who first participated before high school and those who first participated during high school.

Nearly all the estimated impact was because of increased enrollment in two-year community colleges. Enrollment in four-year universities increased by a smaller margin and was only statistically

significant for some groups of students. For the subsample of students we observe for a longer time, we find a small (0.5 percentage points, or about 8 percent) increase in attainment of associate degrees for students who first participated in FTC before high school but no effect for those who entered FTC in high school. We do not find any impacts on bachelor's degree attainment.

The college enrollment effects increase with the number of years a student participates in FTC, from a statistically insignificant increase in the probability of enrollment of about 1 percentage point for those who participated for a single year to 14 to 18 percentage points for those who participated for four or more years. Effects on associate degree attainment are also larger as the number of years a student participates increases, at 1 to 2 percentage points for students who participated for at least three years. Although these results may reflect the benefits of longer participation in FTC, they are more likely to include selection bias than our overall results.

Florida Tax Credit Scholarship Program

History and Eligibility Rules

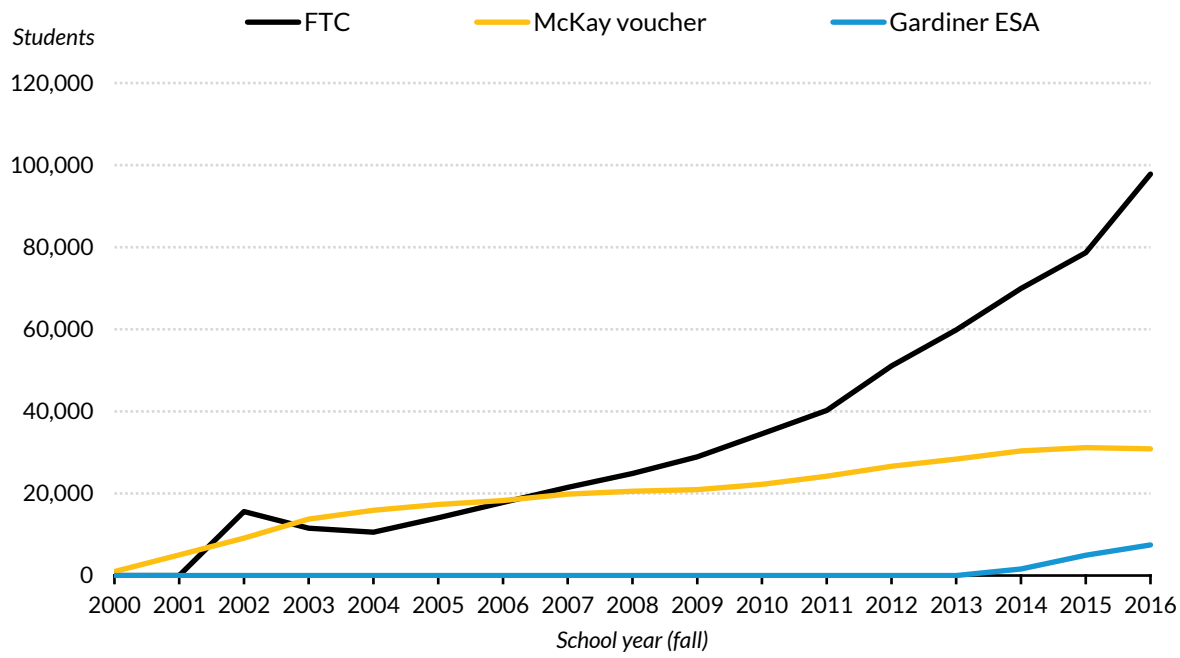
The FTC program became law in the spring of 2001 and first provided scholarships to low-income students beginning in the 2002–03 school year (Figlio and Hart 2014). It is effectively a means-tested school voucher program, but it is called a tax credit scholarship program because the vouchers and scholarships are financed by corporate donations that are reimbursed by corporate tax credits.

Donors receive a tax credit worth 100 percent of donations to scholarship funding organizations (SFOs).[4] These organizations are state-approved nonprofit organizations that administer the scholarships. There were as many as eight SFOs in the early years of the program, but since 2010–11, the program has been administered almost exclusively by the nonprofit Step Up for Students (SUFS).[5]

Figure 1 shows that program participation has grown from fewer than 20,000 students in the early 2000s to about 100,000 today. The number of participating private schools has grown from fewer than 1,000 to just over 2,000, representing 70 percent of private schools in the state.[6] The FTC program is the largest private school choice program in the state, exceeding McKay scholarships and Gardiner education savings accounts, which are limited to students with special needs (figure 1). Participation in the FTC program remains less than half of charter school enrollment (about 270,000 in 2015–16) and less than 4 percent of public school enrollment (almost 2.8 million in 2015–16).[7]

FIGURE 1

Enrollment in Florida School Choice Programs, 2000–16



Sources: "School Choice, Florida," EdChoice, accessed September 14, 2017, https://www.edchoice.org/school-choice/state/florida/.
Note: ESA = education savings accounts; FTC = Florida Tax Credit scholarship program.

Participation in the FTC program is limited to students from low-income families, initially defined as those eligible for free or reduced-price lunch (FRPL) (i.e., coming from households making less than 185 percent of the federal poverty level). The Florida legislature increased the eligibility cutoff for continuing scholarship participants to 200 percent of the federal poverty level beginning in 2006–07 and to 210 percent beginning in 2010–11 (with partial scholarships awarded to families between 200 and 230 percent). The legislature increased the eligibility cutoff for both new and continuing participants to 260 percent beginning in 2016–17, with partial scholarships for families between 200 and 260 percent.[8] In both cases, the legislature specified that priority be given to children from families making less than 185 percent of the federal poverty level, as well as those in foster care if the program is oversubscribed.[9]

For most of the program's history, students entering 2nd through 12th grade on an FTC scholarship had to attend a Florida public school for the full year before enrolling in a private school, with students entering kindergarten and 1st grade exempted from the requirement. The exemption was expanded to

include students from kindergarten through 5th grade beginning in 2012–13, and the prior public school attendance requirement was eliminated beginning in 2014–15.[10]

The maximum scholarship amount was $3,500 in the program's early years and has been increased to more than $6,000 in 2017. The scholarship cannot exceed tuition and fees, and schools are not required to accept the scholarship as full tuition (i.e., schools can require families to cover the difference between the scholarship and tuition). Private schools can continue to use their usual admissions processes to select applicants.

Private schools are required to meet certain standards to enroll students with FTC scholarships, including federal nondiscrimination requirements and state and local health and safety codes. Beginning in 2006–07, participating private schools were also required to administer a norm-referenced test of their choosing (from a state-approved list) to FTC students to assess learning.

Previous Research on the FTC Scholarship

Previous academic research on the FTC program focuses on selection into the program and its effects on students in public schools. Figlio, Hart, and Metzger (2010) examine data on income-eligible students who attended public schools in 2006–07 and find that those who participated in the FTC program in the following year tended to come from low-performing schools and to be among the lower-performing students at their public school. Figlio (2014) examines data from 2012–13 and earlier years and reports that this tendency became stronger over time.

Figlio and Hart (2014) measure the competitive effects of the FTC program on students in public schools before any students used a scholarship to move to private school. They find larger test score improvements in schools that faced greater competition because of the introduction of FTC. The effects are modest in size and consistent with more recent evidence from Ohio (Figlio and Karbownik 2016).

There is little evidence available on how FTC affected student outcomes because comparable data on in-school outcomes, such as test scores, were not collected for public and private school students. Beginning in 2006–07, private schools were required to administer a nationally norm-referenced test. Participating private schools complied with this requirement, and an analysis of data from 2008–09 found evidence of a small FTC test score advantage relative to public school students (Figlio 2011). But this comparison is complicated by the fact that different tests are used and has not been possible since Florida revised its testing program in 2014 (Figlio 2011, 2014).

The available evidence indicates that FTC enrolls students who are triply disadvantaged. They have low family incomes, they are enrolled at low-performing public schools (as measured by test scores), and they have poorer initial test performance compared with their peers. The program's impact on students' long-term academic outcomes remains an open question. We address this gap in the literature by examining the rates at which FTC participants enrolled in and graduated from public colleges and universities in Florida compared with similar nonparticipating students.

Our Research Questions

Private school choice programs like the FTC scholarship can affect participating students' long-term outcomes in at least two ways. First, the programs can have early effects on student learning and noncognitive skills that translate into a higher likelihood of high school graduation, college enrollment, and college graduation. For example, students who use a voucher or tax credit scholarship to attend a private elementary or middle school may acquire skills that benefit them in the long run even if they return to the public sector for high school.

Second, a voucher used to attend a private high school could have additional direct impacts on high school graduation and college enrollment. For example, private high schools may be better (or worse) at keeping students engaged in school, have stricter (or looser) diploma requirements, or be more (or less) effective at helping students navigate the college admissions process.

The first effect should dominate the impact of initiating FTC participation in earlier grades, while the latter should predominate in later grades. Both channels of potential impacts are important, but it is critical to distinguish them from each other. We do not think it makes sense to only present the impacts on college enrollment averaged across all grade levels. We would not want to mix potentially heterogeneous effects for students who used a voucher for one or two years in elementary school with those of students who were in public schools in eighth grade before spending four years in private high schools. The former is the long-run effect of an earlier school choice intervention, whereas the latter is a more direct and immediate impact of the school choice intervention.

We account for the variation in the impact of an FTC scholarship across elementary and high school by estimating program impacts separately by students' grade level in the academic year before their first use of an FTC scholarship. We refer to these as *baseline grades*. We present most results by groupings of these baseline grades before entry into (1) entering elementary and middle school (in 3rd

through 7th grade at baseline), and (2) entering high school (in 8th through 10th grade at baseline). Our primary research questions are as follows:

1. Were students who used a scholarship to attend private elementary and middle schools more likely to attend and graduate from college, regardless of whether the student attended a private high school?
2. Does using a scholarship to attend a private high school (but not a private elementary or middle school) have an impact on the likelihood that a student will attend and graduate from college?

For both research questions, we will also examine whether the impact varies by type of college (e.g., four-year versus community college) and the number of years the students used a scholarship.

Data

Data for the analysis come from two primary data sources: SUFS, the SFO that administers the FTC program, and the Florida Department of Education's Education Data Warehouse (EDW), which provided de-identified comprehensive data on public school students from 2000–01 through 2015–16. Education Data Warehouse staff linked the two datasets using student name, date of birth, Social Security number, gender, and race or ethnicity, a matching process that has an error rate of less than 1 percent.[11]

We use SUFS data to identify FTC scholarship participants, including the years they participated in the program, the schools they attended, and the amount of the scholarship they received. Step Up for Students data contain information from the years SUFS administered the program (2010–11 to present) and information collected from multiple SFOs by the Florida Department of Education and provided to SUFS for earlier years (2004–05 to 2009–10).[12]

The EDW data contain information on all public school students, including FTC participants for the years they were enrolled in public schools and students who never participated in FTC. Education Data Warehouse data contain information on demographic characteristics (age, race or ethnicity, country of birth, receipt of special education services, receipt of FRPL, and language spoken in the home), public school enrollment (institution and grade), test score performance (math and reading scores), and postsecondary enrollment at and degree receipt from public colleges and universities in Florida.

The EDW and SUFS data allow us to construct a panel dataset identifying when each student was enrolled in a public school, a private school through FTC, or neither. Years when students were not

enrolled in school, homeschooled, enrolled in a school in a different state, or enrolled in a private school without an FTC scholarship are not recorded in our data.

The linked EDW-SUFS data are limited to students who previously attended a Florida public school. This should not significantly affect the results' generalizability because all students in the cohorts we examine could only access the FTC scholarship if they had prior contact with the Florida public school system. The match rate for FTC students in those cohorts is 98 percent.

Sample Selection

Only a subset of FTC participants can be included in the treatment group for our analysis. We define the treatment group as FTC scholarship recipients in the SUFS database who met two criteria.

First, they must have been enrolled in the Florida public school system during the school year before receiving the scholarship and taken standardized reading and math tests that year, which are administered in grades 3 through 10. This criterion is necessary for establishing a pretreatment baseline period during which both the treatment and comparison cases have comparable data available in the EDW database on such factors as FRPL participation and test scores.

Second, students must have had the opportunity to graduate at least two years before the end of the period covered by the EDW data to ensure adequate measurement of the outcome variables. This requirement restricts the treatment group to students who would be expected to graduate from high school in 2013–14 or earlier and therefore have potential college enrollment observed through 2015–16, the last year of the data.

Students' expected graduation dates were determined by their grade level during their baseline year.[13] For example, treatment cases that first receive the FTC scholarship as fourth graders, most of whom were third graders in their baseline year, can be drawn from early years, where they have the possibility of graduating by 2013–14, but not later years, where they cannot be observed graduating because of the censoring of students' enrollment histories at the end of the period covered by the data.

These restrictions result in a treatment group sample size of 10,330, of which 6,513 are entering elementary or middle school, and 3,817 are entering high school. Table 1 provides treatment group sample sizes for each combination of baseline grade and year (i.e., the year before receiving an FTC scholarship). Although many students in lower grades during more recent years also received an FTC

scholarship, they are excluded from the treatment sample because they do not have an opportunity to graduate and enroll in college before the end of the observed data period.[14]

TABLE 1

FTC Students in Treatment Sample by Baseline Year and Grade

	Baseline Grade								
Baseline year	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
2003	182	102	180	142	83	60	43	16	808
2004	486	376	413	355	245	161	137	73	2,246
2005		393	502	336	278	231	170	120	2,030
2006			606	392	302	271	188	136	1,895
2007				437	354	301	217	176	1,485
2008					349	347	222	154	1,072
2009						387	238	169	794
Total	**668**	**871**	**1,701**	**1,662**	**1,611**	**1,758**	**1,215**	**844**	**10,330**

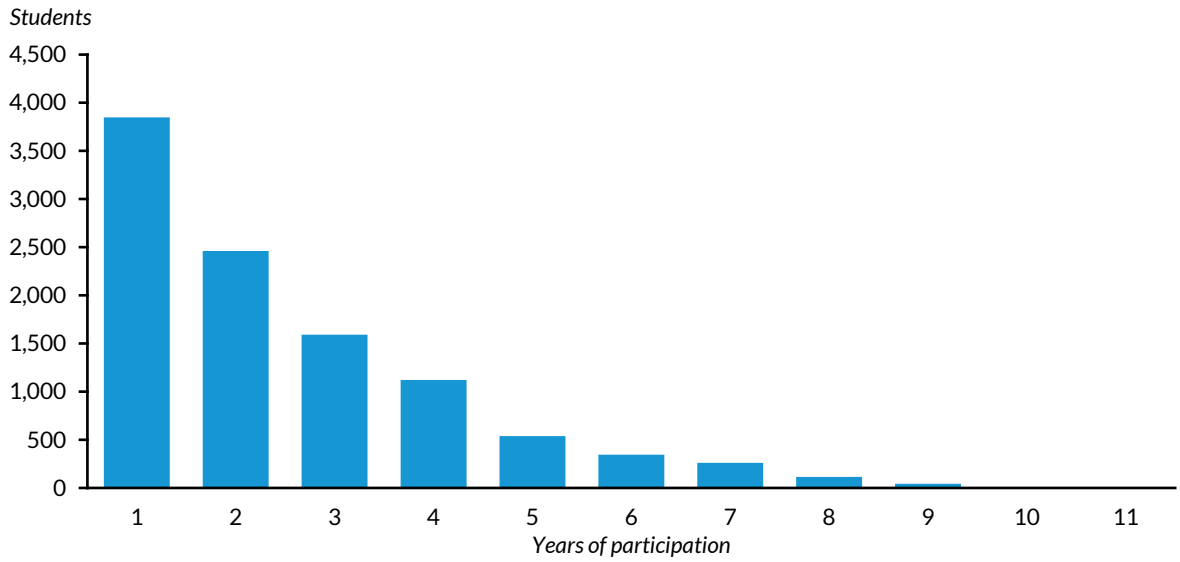
Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.
Notes: Sample includes students for whom enrollment within two years of expected high school graduation is observed (i.e., expected high school graduation of 2013–14 or earlier) and who were tested in a public school in the school year before FTC participation.

Two patterns in table 1 are worth noting. First, in any given year, more FTC students enter the program in lower grade levels than in higher grade levels. This is likely attributable to the lower supply of private high schools compared with private elementary or middle schools[15] and to the fact that the scholarship amount was previously the same for all grade levels, despite high school tuition being higher. Second, within a grade, more students participate in the program over time. This reflects the steady growth of the program since 2003.

The impact of FTC scholarships and vouchers generally is, like any other treatment, potentially affected by how long participating students remain in the program. Students who receive scholarships for many years are more likely to be affected by the program (for better or worse) than those who only participate for one year. Figure 2 shows that 37 percent of students in our treatment sample participated for only one year, 24 percent participated for two years, 15 percent for three years, and 24 percent for four or more years.[16]

FIGURE 2

Years of Participation in the FTC Program



Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.

Our analysis compares the FTC student outcomes with a comparison group of public school students who never participated in FTC. We use several strategies to match FTC students to similar nonparticipants. We restrict the comparison sample to students who were eligible for FRPL during the baseline year, although in sensitivity analyses, we relax this restriction to include students who did not participate in the FRPL program. We also restrict the comparison sample to students who attended a public school that was also attended by at least one FTC participant in the same baseline year and grade, as our matching strategy compares FTC and non-FTC students from the same baseline school, grade, and year.

Outcome Variables

The student outcomes we examine include any college enrollment, enrollment in a community college, enrollment in a four-year public university, persistence (number of semesters attended), and degree attainment. Because some students are observed in the data for a longer period than others, we anchor the enrollment outcome measures to a student's expected high school graduation year to guarantee that the outcome variable has a consistent interpretation across cohorts and that all students have the same opportunity to achieve the outcome variable. College enrollment is measured within two years of

a student's expected graduation from high school (calculated based on the baseline grade). We exclude semesters during and before each student's last academic year enrolled in FTC or a public school (i.e., likely periods of dual enrollment), although our results are not sensitive to this decision.

We measure college persistence as the number of semesters the student was enrolled in a Florida public college within a given numbers of years (up to four) after expected high school graduation for the subsample of students we observe for four postgraduation years. We count enrollment in a given semester (e.g., fall of 2013–14) once, even if the student was enrolled in multiple institutions during that semester. We count summer semester enrollments as half semesters for this calculation because students are unlikely to take a full course load during a summer semester.

We measure degree attainment as receiving an associate degree or bachelor's degree from a Florida public college or university. We measure associate degree attainment for students who were expected to graduate from high school in 2012–13 or earlier, and we measure bachelor's degree attainment for students with expected high school graduation years of 2009–10 or earlier. We include all degrees recorded in the data regardless of the length of time since expected high school graduation.[17]

We can identify only students who enrolled in or graduated from public colleges and universities in Florida. Students who do not appear in the postsecondary data could have enrolled in a private or out-of-state postsecondary institution. This limitation will bias our results only to the extent that FTC participation affects enrollment rates in private or out-of-state institutions relative to nonparticipants. Publicly available data indicate that 79 percent of first-time, degree- or certificate-seeking undergraduate students from Florida who graduated from high school in the previous 12 months enroll in a public, in-state institution.[18]

Data disaggregated by sector of high school are not publicly available for Florida, but nationally representative data indicate that, among undergraduate students from families with incomes below 185 percent of the federal poverty level, 42 percent of students from private high schools enroll in private and out-of-state colleges, compared with only 25 percent of students from public high schools.[19] If this pattern holds for the Florida students in our study, our results may be biased downward.

Methods

The ideal research design for this study would be an experiment in which students who are interested in receiving an FTC scholarship to attend private school enter a lottery that randomly allocates scholarships to some applicants but not others (Chingos and Peterson 2015; Mills and Wolf 2017; Wolf et al. 2010). This would ensure that participating and nonparticipating students are similar, on average, on both measured and unmeasured characteristics.

A randomized design is not possible for the FTC program because our data are retrospective and, in most years, there were enough scholarships to accommodate all eligible students who applied. Instead, we use multiple statistical techniques to compare students who used an FTC scholarship to attend private school with similar students who never participated in FTC. Our preferred estimates combine propensity score matching and multivariate regression, and we employ several robustness checks to confirm that our results are not sensitive to the methodology.

Matching designs are common in the school voucher literature in contexts where eligibility was not randomized (e.g., Cowen et al. 2013), but the quality of any matching design can vary. Heckman, Ichimura, and Todd (1997) and Heckman and coauthors (1996, 1998) outline three requirements for a strong matching design, all of which are met in this analysis. The first requirement is the use of a rich set of matching variables related directly to FTC program participation and educational outcomes. The second requirement is that the comparison group is drawn from the same local area (e.g., schools) as treatment cases. The third requirement is that outcomes for the treatment and comparison groups are measured using the same dataset.

Matching is frequently used in policy evaluation. It satisfies the US Department of Education's What Works Clearinghouse standards "with reservations" if it is well implemented and can be rated as providing "moderate" causal evidence according to the Clearinghouse for Labor Evaluation and Research. The standards for matching designs used by these clearinghouses overlap in many cases with the requirements outlined by Heckman and his coauthors (1996, 1998).

Matching is not a perfect solution to the selection problem. If students who select into the FTC program are substantially different from comparison cases on unmeasured characteristics, the matching estimates may still be biased. Important unmeasured characteristics include student and parental motivation, although these are likely to be at least partially reflected in past school performance indicators, such as test scores. Other unmeasured characteristics that may be related to

selection into the FTC program include religiosity and how much a family knows about the program, although it is less clear how these would be related to the outcomes we examine.

Propensity Score Matching Design

We use a propensity score matching design, introduced by Rosenbaum and Rubin (1983), which reduces bias in treatment effect estimates by aligning a comparison group with the treatment group on observed pretreatment characteristics. In this analysis, we select a comparison group of non-FTC students who were in the same baseline school, grade, and year as the treated FTC scholarship recipients and had similar characteristics and baseline test scores.

The first step of a matching design is to estimate each student's predicted probability of receiving treatment (or propensity score) as a function of a series of matching variables, which in our analysis include language, nativity,[20] race or ethnicity, disability status, a cubic function of math and reading test scores, age, age squared, free (as opposed to reduced-price) lunch participation, and a set of dummies for baseline year.

We estimate the propensity score separately for each baseline grade. This allows the likelihood of treatment to vary by grade for students with the same observed characteristics and controls for all unobserved grade-specific determinants of selection. We do this because of variation in private school availability and developmental milestones from grade to grade. This approach also allows the parameter estimates in the matching equation to vary across grades, reflecting the fundamentally different selection processes operating for students at different points in their education. For example, parents who send an elementary school student to a private school are making a choice that potentially affects almost 10 years of their child's educational trajectory. This is fundamentally different from sending a high school student, who will only attend a few more years of secondary school and has already developed key personal and behavioral traits molded in earlier grades.

After estimating the propensity score by grade, we match each FTC student to the five non-FTC students in the same baseline school, grade, and year with the most similar propensity scores. Exact matching by baseline school ensures that students had similar access to private schools; controls for unmeasured student, family, and neighborhood characteristics associated with the school attended; and corrects for geographic variation in access to college that might affect enrollment decisions (Blagg and Chingos 2016).

Exact matching by grade helps align the measurement of the outcome variables. For example, a treatment case that is in eighth grade at baseline is expected to graduate from high school in Florida in four years after the baseline year. By matching this treatment case to comparison cases that are also in eighth grade, the comparison case has the same amount of time to graduate and achieve other postsecondary outcomes. Exact matching by year ensures that treatment and comparison students are experiencing the Florida education system at the same time, which is potentially important given Florida students' rising performance on exams, such as the National Assessment of Educational Progress over the time period covered by our study (National Center for Education Statistics 2016).

We define a treatment and unmatched comparison sample for each of the 41 combinations of baseline year and grade. The treatment sample includes students who participated in FTC for the first time in the following year.[21] The unmatched comparison sample includes students who participated in the FRPL program in the baseline year, who were attending schools that had treatment cases for that same baseline grade and year, and who never participated in the FTC program.[22]

We then stack these comparison samples into a single dataset and conduct the propensity score estimation separately by baseline grade.[23] We do not estimate the propensity score separately by grade and year because of the small number of treatment observations in some baseline year-grade cohorts that would weaken our ability to produce precise estimates of the propensity score.

The propensity score is then used to select comparison cases so they reflect the treatment group's characteristics in addition to being from the same baseline school, grade, and year. Several strategies are available for matching. Our main estimates use the nearest neighbor method with five nearest neighbors assigned to each treatment case, although we obtain similar results if we instead select a single nearest neighbor. We match "with replacement," which means the same comparison student can be a control for multiple treatment students.

Treatment Effect Estimation

Treatment effect estimates can be generated by taking the difference in means of the newly weighted sample, although a preferable strategy (which we use) is to estimate the treatment effect in a regression framework after conducting the match. A regression framework helps control for remaining imbalances on observed characteristics between the treatment and comparison samples that persist after the match.

We use a probit model to estimate the effect of FTC participation on binary outcomes (any enrollment in college and degree attainment), and an ordinary least squares regression to estimate the effect of FTC participation on the number of semesters enrolled. In both cases, models are weighted using the results of the propensity score matching and the same controls as in the propensity score estimation are included. The one exception is that baseline year dummies are replaced by a full set of dummies for baseline year-grade cohorts so treatment-control comparisons are only made within baseline cohorts.

Descriptive Statistics

A description of the characteristics of the comparison group and FTC students in the analysis sample is presented in table 2. These descriptive statistics are divided between students who were enrolled in grades 3 through 7 in the baseline year and those who were enrolled in grades 8 through 10 in the baseline year.

Non-FTC comparison group students are different from FTC students on many key observed characteristics before they are matched. In all grades, non-FTC students are more likely to be white (45 to 46 percent versus 21 to 23 percent) and not participate in the FRPL program (49 to 58 percent versus 15 to 24 percent).

The full population of non-FTC students also has higher baseline test scores than FTC students, by 0.36 to 0.40 standard deviations in math and 0.29 to 0.39 standard deviations in reading. But on other characteristics, such as the share born outside the US, English language use at home, and age, the full non-FTC sample is fairly similar to the FTC students, even before they are matched.

The imbalance between non-FTC students and FTC students is substantially narrowed by applying the sample restrictions to the non-FTC students in Florida public schools. After restricting the sample of non-FTC students to those enrolled in institutions attended by FTC students and those who receive free or reduced-price lunches, the comparison group is closer to the FTC group in observed characteristics.

TABLE 2A

Descriptive Statistics, Baseline Grades 3–7

	Non-FTC (all)	Non-FTC (sending schools)	Non-FTC (sending schools, FRPL)	Non-FTC (matched and weighted)	FTC
Female	49%	49%	49%	51%	51%
Race/ethnicity					
White	45%	35%	20%	24%	23%
Black	23%	29%	38%	43%	43%
Hispanic	27%	31%	38%	30%	31%
Asian	2%	2%	1%	1%	1%
Other	3%	3%	3%	3%	3%
Born outside US	10%	12%	15%	9%	9%
Language parents speak					
English	76%	71%	62%	73%	72%
Spanish	18%	23%	30%	21%	22%
Other	5%	6%	8%	5%	6%
Disabled	18%	17%	18%	14%	13%
Baseline FRPL					
Free	41%	48%	82%	76%	73%
Reduced	10%	10%	18%	24%	12%
None	49%	41%	0%	0%	15%
Age	11.9	12.3	12.3	11.9	11.9
Baseline math score	0.00	-0.11	-0.35	-0.36	-0.36
Baseline reading score	0.00	-0.10	-0.35	-0.29	-0.29
Percent enrolled					
Any college	45%	45%	38%	39%	44%
Community college	36%	37%	34%	35%	41%
Four-year university	14%	11%	6%	6%	7%
Observations (unweighted)	3,890,456	938,428	537,589	31,245	6,513

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: FRPL = free or reduced-price lunch; FTC = Florida Tax Credit scholarship program. Sample includes students for whom enrollment within two years of expected high school graduation is observed (i.e., expected high school graduation of 2013–14 or earlier). Comparison groups are selected based on nearest neighbor matching (N = 5) with exact matching on baseline school, grade, and year.

TABLE 2B

Descriptive Statistics, Baseline Grades 8–10

	Non-FTC (all)	Non-FTC (sending schools)	Non-FTC (sending schools, FRPL)	Non-FTC (matched and weighted)	FTC
Female	49%	50%	50%	47%	47%
Race/ethnicity					
White	46%	36%	19%	23%	21%
Black	23%	27%	37%	45%	46%
Hispanic	26%	32%	40%	29%	30%
Asian	2%	2%	2%	1%	1%
Other	3%	3%	2%	2%	2%
Born outside US	13%	15%	19%	10%	11%
Language parents speak					
English	76%	70%	59%	75%	74%
Spanish	18%	24%	32%	20%	21%
Other	6%	7%	8%	5%	5%
Disabled	24%	20%	20%	17%	17%
Baseline FRPL					
Free	34%	40%	82%	69%	65%
Reduced	8%	9%	18%	31%	11%
None	58%	52%	0%	0%	24%
Age	15.4	15.3	15.3	15.3	15.2
Baseline math score	0.00	-0.07	-0.33	-0.42	-0.40
Baseline reading score	0.00	-0.07	-0.35	-0.40	-0.39
Percent enrolled					
Any college	50%	50%	43%	41%	47%
Community college	40%	41%	38%	38%	44%
Four-year university	15%	13%	7%	6%	6%
Observations (unweighted)	4,106,790	1,079,398	508,829	18,302	3,817

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: FRPL = free or reduced-price lunch; FTC = Florida Tax Credit scholarship program. Sample includes students for whom enrollment within two years of expected high school graduation is observed (i.e., expected high school graduation of 2013–14 or earlier). Comparison groups are selected based on nearest neighbor matching (N = 5) with exact matching on baseline school, grade, and year.

The major exception is that the non-FTC students are more likely to receive free lunches, and (by construction) all of them receive a FRPL. The 15 percent of FTC students from the lower grades and 24 percent from the higher grades who are not in the FRPL program in their baseline year have to meet income eligibility requirements to participate in the FTC program. It is likely that these students were eligible for a FRPL, but they may not have participated because they did not apply or because they did not qualify during the baseline year because their family's income was higher.

Our methodology effectively matches FTC students who did not participate in the FRPL program (but whom we know to be eligible or recently eligible) to reduced-price comparison students. Below, we

relax this restriction and show that our results are robust to including comparison students who did not participate in the FRPL program at baseline.

The remaining imbalances between the samples (except for reduced-price lunch) are essentially eliminated after matching. The characteristics presented in table 2 report a nearest neighbor match with five nearest neighbors, although other matching strategies produced a similar result. The comparison sample size is not equal to exactly five times the treatment sample size because the same student can be a comparison for multiple treatment students.

Table 2 also reports college enrollment outcomes and shows that the broad population of non-FTC students are more than twice as likely to enroll at a four-year university within two years of expected high school graduation than FRPL participants at FTC-sending schools. Enrollment rates at community colleges are more similar. In Florida, most public college students begin at a two-year college, but this pattern is especially strong for low-income students.

Results

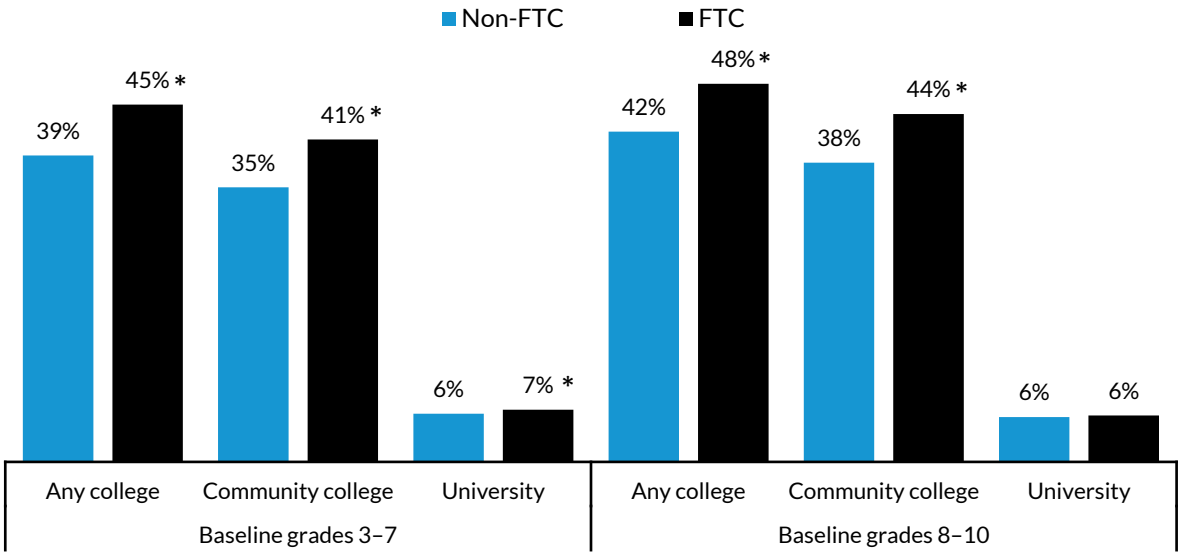
Our findings are based on comparisons of the postsecondary enrollment and graduation outcomes of the sample of FTC students, compared in a regression framework with a matched sample of public school students. The matching process ensures the comparison group is similar to the analysis sample of FTC students, on average, in baseline test scores, gender, race or ethnicity, nativity, language spoken at home, and age. We highlight our primary findings graphically and include the full regression results that underlie these graphics, along with additional results, in appendix A.

College Enrollment

We find consistent evidence that FTC participation had substantial, positive, statistically significant effects on college enrollment for students who entered the FTC program in both elementary or middle school and high school. Figure 3 and appendix table A.1 show a positive impact of 6 percentage points on enrollment at any public college in Florida for both groups, which is a roughly 15 percent increase on top of the control group's attendance rate of about 40 percent.

FIGURE 3

Effect of FTC Participation on Enrollment in a Florida Public College within Two Years of Expected High School Graduation



Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.
* indicates the difference is statistically significant at the 5 percent level.

Almost all the increase in college enrollment attributable to the FTC scholarship occurred at two-year colleges. Students who entered FTC in elementary or middle school saw a statistically significant benefit of only 0.5 percentage points in the four-year college enrollment rate, an 8 percent increase compared with the control group's enrollment rate of 6 percent. For students who entered FTC in high school, the effect was small (0.2 percentage points) and not statistically distinguishable from zero.

Students in the FTC program participate for different amounts of time, so separate treatment effects can be estimated for different lengths of time that a student receives a scholarship. These treatment effects are presented in figure 4. The estimated college enrollment effects increase consistently with the number of years students participated in the FTC program.

Students who participated for only one year appear to have received little benefit, and appendix table A.2 shows the effect for these students is not statistically significant from zero. The effect increases to 3 to 6 percentage points for two-year participants, 8 to 10 percentage points for three-year participants, and 14 to 18 percentage points for students who participated for four or more years. Relative to the control group's college-going rate, these effect sizes translate into increases of 9 to 14

percent (for students who participated for two years), 19 to 25 percent (three years), and 37 to 43 percent (four or more years).

Enrollment effects are concentrated at two-year colleges, but for students who entered FTC in elementary or middle school, there is a positive impact on four-year college enrollment of 0.9 percentage points (15 percent) after three years of participation and 1.5 percentage points (25 percent) after four or more years. The four-year university enrollment results for students entering FTC in high school follow a similar pattern but are smaller and not statistically different from zero.

There are at least three potential explanations for the larger effects for students who participated in FTC for more years: (1) private schools have an effect that either grows or accumulates over time, (2) students who benefited the most from private school attendance were more likely to stay in the program longer, and (3) students who participated longer have characteristics (e.g., motivation, stability at home) that are positively correlated with college enrollment.

We cannot investigate the first two explanations, but we can indirectly test the third by examining students' baseline characteristics and test score performance broken down by the number of years they participated in FTC. These characteristics are presented in appendix table A.3, which shows few consistent patterns that would clearly explain the results. Compared with students who only participated for one year, students who participated for four or more years are more likely to be Hispanic, born outside the US, and not speak English at home and are less likely to be black. The high school participants who participated for four or more years have higher baseline test scores than one-year participants, but there is no comparable test score difference for elementary or middle school entrants.

We interpret the modest differences in observed characteristics, which we account for through regression adjustment, as suggestive evidence that there is not enormous selection into length of participation along unmeasured characteristics. The most substantial differences between groups are the differences in racial and ethnic composition as the number of years of participation increases. Comparable test scores across groups are reassuring, but these results might reflect selection bias. These effects are suggestive but are more prone to bias than the FTC participation effects.

FIGURE 4A

FTC Effects by Years of Participation, Baseline Grades 3–7

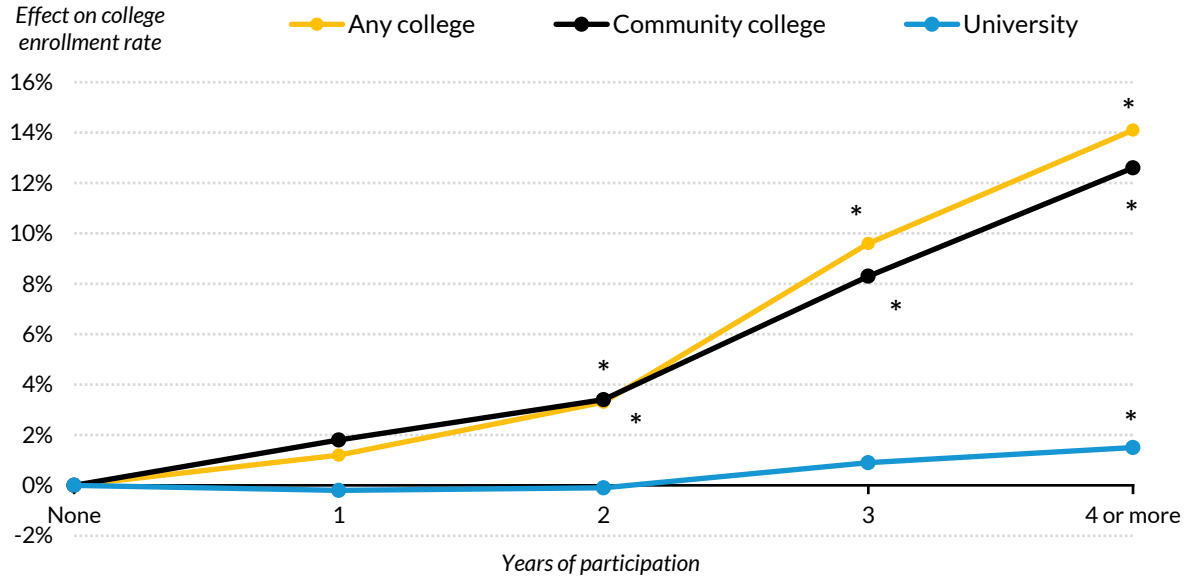
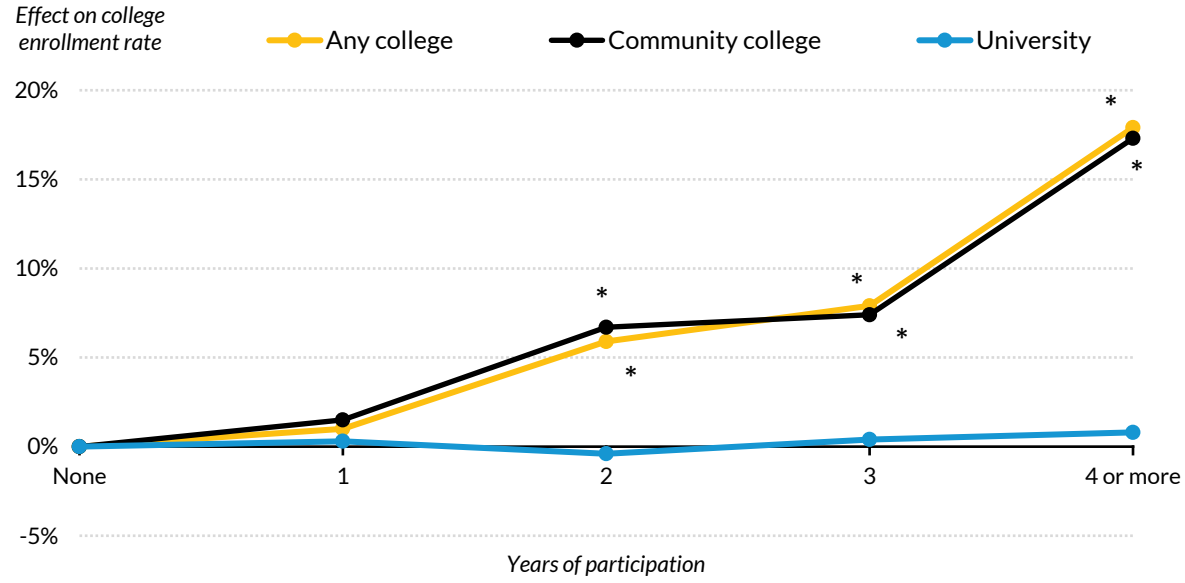


FIGURE 4B

FTC Effects by Years of Participation, Baseline Grades 8–10



Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.

* indicates the difference relative to the non-FTC comparison group is statistically significant at the 5 percent level.

We might also be concerned that students who participated for more years in FTC were also more likely to remain in Florida relative to comparison students, which would upwardly bias the results. We test this hypothesis by rerunning this analysis with a control for the number of years after baseline each student was observed in a Florida public school or in the FTC program. This could bias the results toward a null finding if FTC participation increases the likelihood that a student remains enrolled in school (e.g., through reduced dropout rates in high school). But we obtain results that are qualitatively similar to those reported in appendix table A.3.[24]

Persistence and Degree Attainment

We measure the effect of FTC on college persistence by examining the number of semesters each student was enrolled in a public college in Florida for up to four years after expected high school graduation. For this analysis, the sample is reduced from the full sample for which we observed college enrollment within two years of expected graduation.

The enrollment effect for this subsample of 5,281 FTC students is 7 percentage points within two years of expected high school graduation and about 8 percentage points within four years.[25] If the marginal student enrolled for a single semester and FTC participation had no effect on the number of semesters enrolled among students who were not induced to attend college by FTC, we would expect an average increase of 0.08 semesters enrolled (one induced semester of enrollment for 8 percent of the treated group). Appendix table A.4 shows an increase of 0.17 semesters within four years of expected graduation, roughly twice what we would expect if the only persistence effect was associated with a semester of enrollment for students induced to enroll.[26]

We interpret this as suggestive evidence that many students induced to attend college by participating in FTC did not immediately drop out. But because only 8 percent of participants are induced by FTC to attend college within four years, a small impact on the other (inframarginal) students could explain a significant portion of the estimated impact on semesters enrolled.

The effects of FTC participation on college persistence are, as in college enrollment, dominated by the effect on community college persistence. Participation in the FTC program does, however, have small negative effects on the number of semesters enrolled at four-year universities for students who entered FTC in high school. These effects are statistically significant in some specifications.

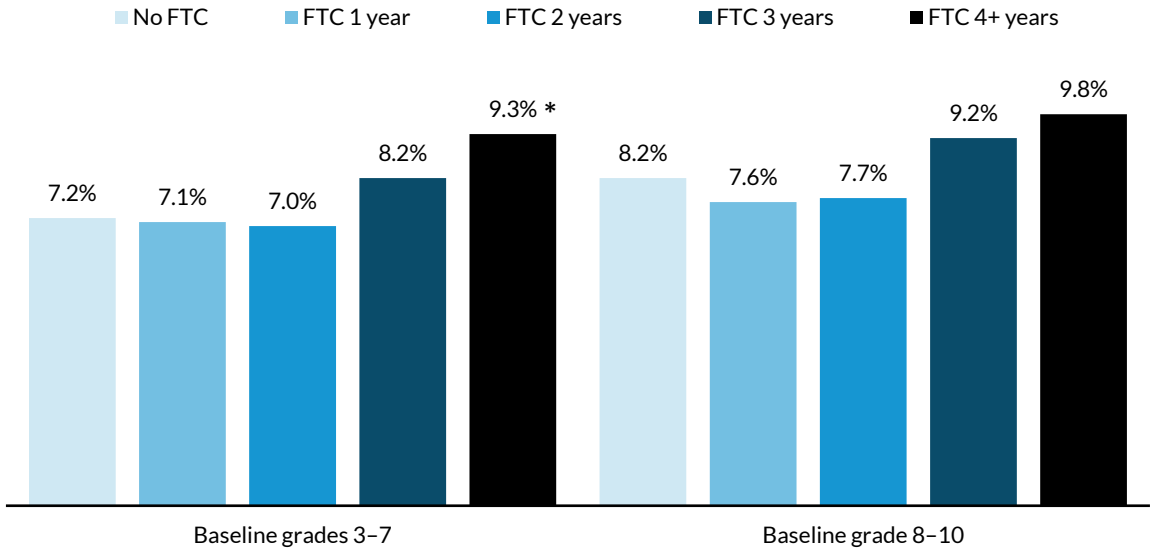
We next turn to postsecondary degree attainment, which is a better measure of college success than the number of semesters enrolled. We can only conduct this analysis for students we observe long

enough in our data to potentially earn a degree: 7,672 FTC students who were expected to graduate by 2012–13 for the associate degree analysis and 1,981 FTC students who were expected to graduate by 2009–10 for the bachelor's degree analysis.

Appendix table A.5 shows nil to modest impacts of FTC participation on degree attainment. The associate degree attainment rate of FTC participants who entered the program in the earlier grades was 0.6 percentage points (about 8 percent) higher than comparison students, but there was no difference for students who started FTC in high school.[27] Figure 5 shows that the effect on associate degree attainment was larger, at 1 to 2 percentage points, among students who participated in FTC for at least three years but was only statistically significant for students who started FTC in the earlier grades.

FIGURE 5

Associate Degree Attainment Rates by Years of FTC Participation



Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.

* indicates the difference relative to the non-FTC comparison group is statistically significant at the 5 percent level.

Bachelor's degree attainment rates did not differ between FTC and comparison students, although the results are imprecisely estimated because of the small sample of students for whom we can conduct this analysis. For example, we cannot rule out positive or negative effects up to 1.4 percentage points, which would be a large impact relative to the comparison group's low bachelor's degree attainment rate of 4 percent.

Subgroups

Prior research indicates that the effect of private school choice may vary by student subgroup (Chingos and Peterson 2015). We estimate college enrollment effects for several demographic groups and by quartile of baseline test scores (defined using the statewide test score distribution) and selected characteristics of the baseline public school. The results are reported in appendix table A.6 for elementary and middle school entrants and appendix table A.7 for high school entrants. Each line of these tables reports the results from a separate regression restricted to the identified subgroup.

We find only one pattern of subgroup results that appears in both the elementary and middle school and high school samples and is statistically different between subgroups. Children born outside the US benefited more than children born in the US.[28] This result could be partly because foreign-born children participate in the FTC program for a longer period, on average, than native-born children.

Results disaggregated by the letter grade of the baseline school (a measure of school quality under the state's accountability system) do not follow a clear pattern (appendix table A.8). We might have expected students from low-performing public schools to benefit more from FTC, but that is not consistently the case. Students from both high- and low-performing schools appear to have benefited from participating in the program. Appendix table A.8 also shows that results separated by whether the baseline school is a charter school. Results for charters are imprecise, given the small numbers of FTC students coming from these schools, and the results for traditional public schools are similar to our overall results.

We also estimate enrollment impacts by baseline grade and year (appendix table A.10). We find the largest impacts in baseline grades that generally lead to school transitions: fifth grade, which immediately precedes middle school for many students, and eighth grade, which generally precedes high school. We speculate that using FTC to switch to private school may be less disruptive in these grades relative to the comparison group because both groups of students would have changed schools anyway.

Enrollment impacts disaggregated by baseline year do not exhibit a clear trend. We might have expected the FTC effect to change as the program expanded and as the public school system made substantial improvements. That this is not the case could reflect offsetting effects, such as improvements in the FTC program offsetting improvements in the public school system.

Finally, we calculate enrollment impacts separately for different categories of private schools. We identify the first private school attended as an FTC participant by each FTC student and conduct a

separate matching analysis to construct a comparison group of non-FTC students for each category of private school we examine. We construct categories of private schools using data from the federal Private School Survey, a survey of Florida private schools, and enrollment data from SUFS.

Appendix table A.9 shows that groups of private schools vary in their estimated effectiveness at increasing college enrollment. Catholic and non-Christian religious schools have the largest estimated impacts, although few students attend these schools. Using FTC to attend a Catholic school also has a significant positive impact on enrollment in four-year public universities. Most students attend non-Catholic Christian schools, which have effects in line with our main results. Attending a nonreligious private school does not have a significant average impact, either positive or negative.

We also find suggestive evidence of larger impacts of attending schools that existed before the students in our study entered the FTC program and schools that enrolled smaller shares of FTC students. Schools that appear to rely more heavily on the FTC program, such as those where most students are on FTC scholarships and those that appear to have opened after 2003, do not have estimated positive impacts as large as schools less reliant on the FTC program and are not always statistically distinguishable from zero.

Robustness

We subject our main college enrollment results to several changes in our model specifications. None of them alter our substantive conclusion that FTC participation increased the rate at which students enrolled in Florida public colleges and universities. These robustness checks are summarized in appendix tables A.11 and A.12.

Our preferred method matches each FTC student to five control students with similar baseline test scores and demographic characteristics in the same baseline school and year. Matching each FTC student to either one student in the same baseline school and year or five control students in any baseline school and year has little impact on the results (#2 and #3 in appendix table A.11), as does using our preferred matching strategy with no controls (#4) and including the full set of potential control students (FRPL students from the same public schools) without any matching (#5). Dropping counties in northern Florida (the Panhandle and Crown regions), where students may be more likely to cross the border to attend college in a neighboring state, also has little effect on the results (#6).

We test the impact of several changes to the non-FTC students we choose to include in the control group. Adding control students who participated in FTC later to the control group for earlier baseline

year-grade cohorts has almost no effect on the results (#7). Dropping control students who were not tested in public schools in the year after baseline (e.g., because they attended a private school on their own, were homeschooled, or left Florida) reduces the estimated treatment effects slightly (#8).

We also test the sensitivity of our results to adding to the control group students from FTC-sending schools who were not eligible for FRPL at baseline. This more than doubles our sample size and includes many students who were not eligible for FTC. The controls include a dummy for free lunch at baseline but do not distinguish between children who received a reduced-price lunch and those who did not participate at baseline. This robustness check compares FTC students who did not receive a free lunch (but all of whom were eligible or nearly eligible for at least a reduced lunch) with otherwise observationally similar students (e.g., in terms of baseline test scores and race or ethnicity) but who are almost surely less economically disadvantaged. This change modestly reduces the estimated FTC participation effect on college enrollment to 4 to 5 percentage points (#9).

Finally, we add additional controls for FRPL participation in the spirit of Michelmore and Dynarski (2016) and pretreatment test scores for students observed in the Florida public schools in the year before the baseline year. Appendix table A.12 shows that restricting the sample to these students observed in public schools before the baseline year slightly changes the estimated effects but that adding an additional pretreatment year of time-varying controls barely changes the results.

Conclusion

We find clear evidence that participants in the nation's largest private school choice programs were more likely to enroll in a community college than similar students who remained in public schools, with larger effects for students who spent more years in the program. We also find evidence of a modest effect on the attainment of associate degrees by students who entered FTC before high school. But this effect (0.6 percentage points) is smaller than the 1 percentage point impact we might have expected by multiplying the enrollment effect of 6 percentage points and the comparison group's implied graduation rate of about 18 percent.

We find weaker evidence of FTC participation effects on enrollment in four-year colleges and no evidence of effects on bachelor's degree attainment. But it is too soon to accurately measure bachelor's degree attainment for most students in this study.

Our study is subject to several limitations. First, our matching methodology does not rule out the possibility that unmeasured differences between FTC and non-FTC students are biasing our results. But

the matching algorithm performs well in eliminating differences in the observed characteristics of treatment and comparison students, and our results are robust to a wide variety of changes to our methodology.

Second, we only observe enrollment at public colleges in Florida. We do not observe enrollment at out-of-state, private nonprofit, and for-profit colleges. Measuring the impact of FTC participation on enrollment at (and degree receipt from) these colleges requires access to more comprehensive data than are available. But if attending a private school through FTC increases the likelihood of subsequently attending a private college, as national data suggest is the case, the restriction of the outcomes data to public colleges would imply that the estimated effect of FTC participation is understated.

Finally, we only observe students for a limited period after expected high school graduation. This significantly reduces the number of students for whom we can measure degree attainment, especially four-year degrees. Continuing to track postsecondary enrollment and degree outcomes of these students is fertile ground for future research, as is examining their labor market outcomes, including employment rates and earnings.

It will also be important to track the outcomes of students who first received a scholarship in more recent years as they progress through the program, especially those from families between 200 and 260 percent of the federal poverty level who became eligible for partial scholarships beginning in 2016–17. Students who did not previously attend a public school, who became eligible regardless of grade beginning in 2014–15, also warrant examination but will be difficult to compare with public school students without consistent baseline data.

These limitations aside, this study is the first systematic evaluation of the impact of participating in a statewide private school choice program on college enrollment and degree attainment. The positive effects are noteworthy in light of evidence that the FTC program more than covers the foregone tax revenue through reduced spending on the public schools many participants would have attended. The Florida Legislature's Office of Program Policy Analysis and Government Accountability (2010) estimated that the program saved $36.2 million in 2008–09, or about $1,700 per scholarship awarded.[29]

The findings are also notable in light of recent evidence that participating in a statewide private school choice program reduced student achievement (as measured by state tests) in Indiana, Louisiana, and Ohio. The lack of rigorous test score evidence on the FTC program limits our ability to speculate about whether a program that has negative impacts on test scores can have neutral or even positive

effects on college enrollment and degree attainment. But the possible divergence in findings highlights the need to track multiple measures to assess the impacts of programs and policies aimed at improving outcomes for disadvantaged students.

Appendix A. Additional Tables

TABLE A.1

Effect of Any FTC Participation on Florida Public College Enrollment within Two Years of Expected High School Graduation

	Baseline Grade 3–7			Baseline Grade 8–10		
	Any college	Community	University	Any college	Community	University
FTC (0/1)	0.064**	0.060**	0.005*	0.060**	0.061**	0.002
	(0.007)	(0.007)	(0.002)	(0.010)	(0.009)	(0.002)
Control mean	0.385	0.345	0.0606	0.415	0.376	0.0563
Observations	37,739	37,739	37,685	22,107	22,107	22,082

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: FTC = Florida Tax Credit scholarship program. "Community" indicates community college. "University" indicated four-year university. ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. Treatment estimates are marginal effects from probit regressions. Sample includes students for whom enrollment within two years of expected high school graduation is observed (i.e., expected high school graduation of 2013–14 or earlier). All models include controls for receipt of free lunch in the baseline year, gender, race or ethnicity (black, Hispanic, Asian, Hawaiian, Native American, multiple race, or other race), a full interaction of nativity (born in the US or foreign born) and language spoken at home by parents (English, Spanish, other, or missing), disability status, age and age squared in baseline year, and a cubic function of the cohort-normalized Florida Comprehensive Assessment Test reading and math scores from their baseline year. All models are based on nearest neighbor matching (N = 5) with exact matching on baseline school, grade, and year.

TABLE A.2

FTC Participation Effects by Years of Participation, on College Enrollment within Two Years of Expected Graduation

	Baseline Grades 3–7			Baseline Grades 8–10		
	Enroll any	Enroll CC	Enroll UNI	Enroll any	Enroll CC	Enroll UNI
FTC for 1 year	0.012	0.018+	-0.002	0.010	0.015	0.003
	(0.011)	(0.011)	(0.003)	(0.014)	(0.013)	(0.003)
FTC for 2 years	0.033*	0.034*	-0.001	0.059**	0.067**	-0.004
	(0.015)	(0.014)	(0.004)	(0.017)	(0.016)	(0.003)
FTC for 3 years	0.096**	0.083**	0.009+	0.079**	0.074**	0.004
	(0.018)	(0.018)	(0.005)	(0.023)	(0.022)	(0.005)
FTC for 4+ years	0.141**	0.126**	0.015**	0.179**	0.173**	0.008
	(0.014)	(0.013)	(0.004)	(0.024)	(0.023)	(0.005)
Control mean	0.385	0.345	0.0606	0.415	0.376	0.0563
Observations	37,739	37,739	37,685	22,107	22,107	22,082

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: CC = community college; FTC = Florida Tax Credit; UNI = four-year university. "Any" indicates any enrollment in college. ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. See table A.1 notes for sample and specification details.

TABLE A.3

Descriptive Statistics, by Years of FTC Participation

	FTC, Baseline Grade 3–7				FTC, Baseline Grade 8–10			
	1 year	2 years	3 years	4+ years	1 year	2 years	3 years	4+ years
Female	49%	52%	52%	53%	44%	48%	50%	46%
Race/ethnicity								
White	22%	26%	21%	22%	21%	21%	21%	20%
Black	47%	45%	43%	36%	49%	46%	45%	38%
Hispanic	27%	26%	32%	38%	27%	29%	31%	40%
Asian	1%	1%	1%	2%	1%	1%	1%	1%
Other	3%	2%	3%	3%	2%	3%	2%	2%
Born outside US	8%	9%	9%	12%	9%	11%	11%	14%
Language parents speak								
English	75%	74%	68%	68%	76%	74%	74%	67%
Spanish	20%	20%	23%	25%	18%	20%	22%	27%
Other	5%	6%	9%	7%	6%	6%	4%	5%
Disabled	13%	12%	10%	16%	15%	20%	16%	18%
Baseline FRPL								
Free	72%	73%	77%	73%	65%	65%	62%	69%
Reduced	13%	11%	10%	12%	10%	9%	13%	13%
None	15%	16%	13%	15%	25%	26%	25%	18%
Age	12.1	11.9	11.7	11.5	15.3	15.6	15.1	14.5
Baseline math score	-0.36	-0.40	-0.31	-0.36	-0.42	-0.45	-0.36	-0.29
Baseline reading score	-0.29	-0.32	-0.22	-0.29	-0.42	-0.45	-0.34	-0.28
Observations	2,382	1,355	924	1,890	1,512	1,140	679	552

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: FRPL = free or reduced-price lunch; FTC = Florida Tax Credit. Sample includes students for whom enrollment within two years of expected high school graduation is observed (i.e., expected high school graduation of 2013–14 or earlier).

TABLE A.4

Effect of Any FTC Participation on Semesters of Florida Public College Enrollment within Four Years of Expected High School Graduation

	BASELINE GRADES 3–7											
	Semesters Enrolled in Any Florida Public College within				Semesters Enrolled in Any Florida Community College within				Semesters Enrolled in Any Florida Public University within			
	1 year	2 years	3 years	4 years	1 year	2 years	3 years	4 years	1 year	2 years	3 years	4 years
FTC (0/1)	0.082**	0.121**	0.139**	0.172**	0.082**	0.123**	0.148**	0.188**	0.008	0.007	0.004	-0.007
	(0.021)	(0.036)	(0.050)	(0.063)	(0.021)	(0.034)	(0.046)	(0.055)	(0.011)	(0.020)	(0.029)	(0.037)
Control mean	0.618	1.196	1.696	2.120	0.492	0.948	1.308	1.569	0.115	0.226	0.357	0.515
Observations	14,143	14,143	14,143	14,143	14,143	14,143	14,143	14,143	14,143	14,143	14,143	14,143

	BASELINE GRADES 8–10											
	Semesters Enrolled in Any Florida Public College within				Semesters Enrolled in Any Florida Community College within				Semesters Enrolled in Any Florida Public University within			
	1 year	2 years	3 years	4 years	1 year	2 years	3 years	4 years	1 year	2 years	3 years	4 years
FTC (0/1)	0.078**	0.121**	0.151**	0.169**	0.105**	0.170**	0.212**	0.230**	-0.020*	-0.038*	-0.046+	-0.043
	(0.021)	(0.036)	(0.050)	(0.063)	(0.020)	(0.032)	(0.042)	(0.051)	(0.010)	(0.018)	(0.027)	(0.037)
Control mean	0.624	1.223	1.716	2.139	0.498	0.978	1.340	1.611	0.110	0.213	0.334	0.474
Observations	16,458	16,458	16,458	16,458	16,458	16,458	16,458	16,458	16,458	16,458	16,458	16,458

Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.

Notes: ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. Sample includes students for whom enrollment within four years of expected high school graduation is observed (i.e., expected high school graduation of 2011–12 or earlier). Estimates are based on ordinary least squares regressions with same control variables listed in table A.1 notes.

TABLE A.5

Effect of FTC Participation and Dosage on Degree Attainment from Florida Public Colleges

	Baseline Grades 3–7			
	Associate	**Associate**	**Bachelor's**	**Bachelor's**
FTC (0/1)	0.006+		-0.004	
	(0.003)		(0.005)	
FTC for 1 year		-0.001		-0.001
		(0.005)		(0.006)
FTC for 2 years		-0.002		-0.008
		(0.006)		(0.007)
FTC for 3 years		0.010		0.008
		(0.009)		(0.014)
FTC for 4+ years		0.021**		-0.009
		(0.007)		(0.006)
Control mean	0.072	0.072	0.054	0.054
Observations	24,580	24,580	2,744	2,744

	Baseline Grades 8–10			
	Associate	**Associate**	**Bachelor's**	**Bachelor's**
FTC (0/1)	0.000		0.004	
	(0.004)		(0.005)	
FTC for 1 year		-0.006		-0.001
		(0.005)		(0.006)
FTC for 2 years		-0.005		0.002
		(0.006)		(0.007)
FTC for 3 years		0.010		0.014
		(0.008)		(0.012)
FTC for 4+ years		0.016		0.013
		(0.011)		(0.015)
Control mean	0.082	0.082	0.055	0.055
Observations	19,817	19,817	8,665	8,665

Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.

Notes: ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. Sample limited to students with expected high school graduation by 2012–13 for associate degrees and 2009–10 for bachelor's degrees.

TABLE A.6

Subgroup Analysis, Enrollment at Florida Public College within Two Years of Expected High School Graduation, Baseline Grades 3–7

				Any College			Community College			University		
	Dosage	T obs.	C obs.	Estimate	Std. error	C mean	Estimate	Std. error	C mean	Estimate	Std. error	C mean
Female	2.8	3,312	15,921	0.068**	(0.010)	0.448	0.062**	(0.010)	0.401	0.005+	(0.003)	0.0745
Male	2.7	3,201	15,324	0.057**	(0.010)	0.320	0.055**	(0.010)	0.288	0.004+	(0.002)	0.0461
Asian	3.6	72	324	0.148*	(0.061)	0.623	0.068	(0.073)	0.476	0.103+	(0.057)	0.193
Black	2.6	2,776	13,327	0.062**	(0.011)	0.370	0.054**	(0.010)	0.330	0.008*	(0.003)	0.0615
Hispanic	3.1	2,012	9,316	0.058**	(0.013)	0.468	0.062**	(0.013)	0.423	-0.002	(0.002)	0.0659
White	2.7	1,470	7,459	0.064**	(0.015)	0.296	0.064**	(0.014)	0.269	0.002	(0.003)	0.0436
Other race/ethnicity	2.6	183	819	0.042	(0.046)	0.415	0.028	(0.043)	0.358	0.004	(0.009)	0.0879
Born outside US	3.2	603	2,829	0.128**	(0.027)	0.461	0.101**	(0.024)	0.405	0.013+	(0.007)	0.0779
Born in US	2.7	5,910	28,416	0.058**	(0.008)	0.378	0.056**	(0.007)	0.339	0.004+	(0.002)	0.0589
Does not speak English at home	3.0	1,837	8,453	0.072**	(0.014)	0.489	0.066**	(0.014)	0.440	0.003	(0.003)	0.0721
Speaks English at home	2.7	4,676	22,792	0.060**	(0.008)	0.347	0.057**	(0.008)	0.311	0.005*	(0.002)	0.0564
Free lunch at baseline	2.8	4,758	23,623	0.066**	(0.009)	0.362	0.062**	(0.008)	0.327	0.004+	(0.002)	0.0514
Reduced-price lunch at baseline	2.8	781	7,622	0.047*	(0.020)	0.458	0.044*	(0.019)	0.402	0.000	(0.006)	0.0889
Baseline math score Q1	2.8	2,085	9,792	0.049**	(0.011)	0.257	0.049**	(0.011)	0.251	0.001	(0.001)	0.00915
Baseline math score Q2	2.7	2,115	10,024	0.066**	(0.013)	0.379	0.065**	(0.013)	0.359	0.005	(0.003)	0.0314
Baseline math score Q3	2.7	1,672	8,085	0.063**	(0.014)	0.476	0.059**	(0.014)	0.416	0.009	(0.007)	0.0914
Baseline math score Q4	2.9	641	3,344	0.084**	(0.022)	0.570	0.059**	(0.023)	0.414	0.016	(0.019)	0.230
Baseline reading score Q1	2.8	1,912	8,955	0.056**	(0.012)	0.256	0.059**	(0.011)	0.249	-0.002	(0.001)	0.00991
Baseline reading score Q2	2.7	2,188	10,335	0.068**	(0.012)	0.376	0.062**	(0.012)	0.358	0.009**	(0.003)	0.0307
Baseline reading score Q3	2.8	1,678	8,435	0.054**	(0.015)	0.468	0.043**	(0.014)	0.410	0.013+	(0.007)	0.0905
Baseline reading score Q4	2.8	735	3,520	0.076**	(0.021)	0.549	0.083**	(0.021)	0.403	0.002	(0.016)	0.210

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: Q indicates quartile. ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. See table A.1 notes for sample and specification details.

TABLE A.7

Subgroup Analysis, Enrollment at Florida Public College within Two Years of Expected High School Graduation, Baseline Grades 8–10

				Any College			Community College			University		
	Dosage	T obs.	C obs.	Estimate	Std. error	C mean	Estimate	Std. error	C mean	Estimate	Std. error	C mean
Female	2.1	1,781	8,645	0.060**	(0.015)	0.478	0.076**	(0.014)	0.428	-0.005+	(0.002)	0.0738
Male	2.1	2,036	9,657	0.061**	(0.013)	0.359	0.049**	(0.012)	0.329	0.007*	(0.003)	0.0408
Asian	2.0	26	129	0.284**	(0.079)	0.585	0.301**	(0.096)	0.438	0.000	(0.000)	0.177
Black	2.0	1,741	8,203	0.034*	(0.014)	0.402	0.039**	(0.013)	0.360	-0.002	(0.003)	0.0581
Hispanic	2.2	1,156	5,280	0.079**	(0.019)	0.491	0.083**	(0.018)	0.449	0.003	(0.002)	0.0613
White	2.1	806	4,245	0.088**	(0.021)	0.337	0.078**	(0.019)	0.311	0.003	(0.002)	0.0409
Other race/ethnicity	2.1	88	445	0.015	(0.065)	0.439	-0.039	(0.059)	0.390	0.006	(0.011)	0.0749
Born outside US	2.3	403	1,830	0.157**	(0.034)	0.435	0.174**	(0.034)	0.399	-0.000	(0.001)	0.0517
Born in US	2.1	3,414	16,472	0.049**	(0.010)	0.412	0.049**	(0.009)	0.373	0.002	(0.002)	0.0568
Does not speak English at home	2.2	987	4,463	0.079**	(0.021)	0.510	0.080**	(0.021)	0.466	0.000	(0.002)	0.0632
Speaks English at home	2.0	2,830	13,839	0.054**	(0.011)	0.384	0.054**	(0.010)	0.347	0.002	(0.002)	0.0541
Free lunch at baseline	2.1	2,480	12,588	0.070**	(0.012)	0.384	0.068**	(0.011)	0.355	0.002	(0.002)	0.0419
Reduced-price lunch at baseline	2.2	413	5,714	0.003	(0.027)	0.482	0.016	(0.026)	0.421	-0.003	(0.005)	0.0882
Baseline math score Q1	2.1	1,250	5,991	0.066**	(0.015)	0.271	0.065**	(0.015)	0.267	0.000	(0.000)	0.00537
Baseline math score Q2	2.1	1,318	6,162	0.070**	(0.017)	0.421	0.076**	(0.016)	0.404	-0.001	(0.002)	0.0259
Baseline math score Q3	2.1	914	4,545	0.029	(0.018)	0.520	0.024	(0.018)	0.458	0.009	(0.009)	0.0911
Baseline math score Q4	2.2	335	1,604	0.022	(0.030)	0.647	0.034	(0.033)	0.452	0.015	(0.028)	0.273
Baseline reading score Q1	2.0	1,294	6,103	0.058**	(0.015)	0.280	0.058**	(0.014)	0.275	0.000	(0.000)	0.00653
Baseline reading score Q2	2.1	1,220	5,801	0.081**	(0.018)	0.409	0.081**	(0.018)	0.388	0.002	(0.003)	0.0286
Baseline reading score Q3	2.1	926	4,476	0.021	(0.019)	0.528	0.026	(0.019)	0.471	0.002	(0.007)	0.0847
Baseline reading score Q4	2.1	377	1,922	0.076**	(0.028)	0.605	0.076*	(0.031)	0.440	-0.001	(0.023)	0.237

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: Q indicates quartile. ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. See table A.1 notes for sample and specification details.

TABLE A.8

Analysis by Baseline School Characteristics, Enrollment at Florida Public College within Two Years of Expected High School Graduation, Baseline Grades 3–7 and 8–10

				Any College			Community College			University		
	Dosage	T obs.	C obs.	Estimate	Std. error	C mean	Estimate	Std. error	C mean	Estimate	Std. error	C mean
Baseline grades 3–7												
School grade A	2.8	2,645	12,838	0.064**	(0.011)	0.425	0.062**	(0.011)	0.373	0.009*	(0.004)	0.0786
School grade B	2.7	1,301	6,289	0.050**	(0.016)	0.381	0.035*	(0.015)	0.347	0.004	(0.003)	0.0553
School grade C	2.8	1,835	8,912	0.069**	(0.014)	0.362	0.073**	(0.013)	0.329	-0.000	(0.003)	0.0484
School grade D or F	2.8	538	2,569	0.087**	(0.023)	0.330	0.083**	(0.023)	0.300	0.001	(0.004)	0.0418
Traditional public school	2.8	6,085	29,536	0.065**	(0.007)	0.385	0.062**	(0.007)	0.344	0.004*	(0.002)	0.0611
Charter school	2.9	362	1,660	0.021	(0.029)	0.415	0.016	(0.030)	0.377	0.007	(0.004)	0.0601
Baseline grades 8–10												
School grade A	2.3	1,032	4,983	0.071**	(0.017)	0.458	0.070**	(0.017)	0.400	0.005	(0.005)	0.0811
School grade B	2.1	735	3,577	0.067**	(0.021)	0.436	0.068**	(0.020)	0.398	0.000	(0.003)	0.0563
School grade C	2.1	1,006	4,917	0.049*	(0.019)	0.422	0.053**	(0.018)	0.390	-0.000	(0.003)	0.0488
School grade D or F	1.8	845	4,121	0.041*	(0.018)	0.382	0.043*	(0.018)	0.350	-0.001	(0.002)	0.0457
Traditional public school	2.1	3,556	17,280	0.057**	(0.010)	0.411	0.059**	(0.009)	0.373	0.002	(0.002)	0.0549
Charter school	2.3	214	986	0.073+	(0.042)	0.498	0.101*	(0.042)	0.440	-0.003	(0.005)	0.0826

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. See table A.1 notes for sample and specification details.

TABLE A.9

Enrollment at Florida Public College within Two Years of Expected High School Graduation, by Category of First Private School Attended

				Any College			Community College			University		
	Dosage	T obs.	C obs.	Estimate	Std. error	C mean	Estimate	Std. error	C mean	Estimate	Std. error	C mean
Baseline grades 3–7												
Catholic school	3.0	677	3,303	0.141**	(0.023)	0.43	0.110**	(0.023)	0.38	0.017*	(0.008)	0.07
Other Christian school	2.7	4,019	19,456	0.059**	(0.009)	0.37	0.057**	(0.009)	0.33	0.003	(0.002)	0.06
Other religious school	3.2	271	1,337	0.117**	(0.042)	0.40	0.093*	(0.039)	0.35	0.010	(0.017)	0.08
Nonreligious school	2.6	748	3,628	0.015	(0.022)	0.40	0.020	(0.021)	0.36	-0.001	(0.004)	0.06
Religiosity/affiliation missing	2.7	779	3,819	0.026	(0.019)	0.41	0.045*	(0.018)	0.37	-0.007*	(0.003)	0.06
School in PSS in 2003	2.8	3,570	17,364	0.085**	(0.010)	0.39	0.073**	(0.010)	0.35	0.010**	(0.003)	0.06
School appeared in PSS after 2003	2.6	950	4,630	0.043*	(0.018)	0.35	0.046**	(0.017)	0.31	0.000	(0.004)	0.06
School never in PSS 2003–13	2.7	1,974	9,596	0.036**	(0.012)	0.40	0.046**	(0.012)	0.35	-0.002	(0.003)	0.06
School less than 25% FTC	2.8	2,296	11,195	0.091**	(0.012)	0.39	0.078**	(0.012)	0.35	0.012**	(0.004)	0.06
School 25–50% FTC	2.9	1,437	7,015	0.072**	(0.016)	0.38	0.063**	(0.015)	0.34	0.004	(0.004)	0.06
School 50–100% FTC	2.5	787	3,842	0.046*	(0.020)	0.37	0.044*	(0.020)	0.33	0.002	(0.005)	0.06
School % FTC missing	2.7	1,974	9,596	0.036**	(0.012)	0.40	0.046**	(0.012)	0.35	-0.002	(0.003)	0.06
Baseline grades 8–10												
Catholic school	2.5	552	2,677	0.111**	(0.028)	0.50	0.079**	(0.027)	0.45	0.031*	(0.012)	0.08
Other Christian school	2.0	2,422	11,735	0.055**	(0.012)	0.40	0.064**	(0.011)	0.36	-0.002	(0.002)	0.05
Other religious school	2.1	97	476	0.236**	(0.072)	0.42	0.215**	(0.066)	0.36	-0.001	(0.004)	0.07
Nonreligious school	2.0	460	2,215	0.003	(0.027)	0.40	0.024	(0.025)	0.36	-0.003+	(0.002)	0.05
Religiosity/affiliation missing	1.9	274	1,331	0.039	(0.034)	0.40	0.040	(0.034)	0.37	-0.000	(0.004)	0.04
School in PSS in 2003	2.1	2,234	10,862	0.083**	(0.013)	0.43	0.080**	(0.012)	0.39	0.006+	(0.003)	0.06
School appeared in PSS after 2003	1.9	687	3,307	0.001	(0.020)	0.37	0.013	(0.020)	0.34	-0.003	(0.002)	0.04
School never in PSS 2003–13	2.1	884	4,309	0.050*	(0.021)	0.42	0.054**	(0.020)	0.38	-0.003	(0.003)	0.05
School less than 25% FTC	2.1	1,587	7,765	0.083**	(0.015)	0.44	0.080**	(0.014)	0.40	0.009+	(0.005)	0.07
School 25–50% FTC	2.1	854	4,129	0.048*	(0.021)	0.39	0.058**	(0.021)	0.36	-0.003+	(0.002)	0.04
School 50–100% FTC	1.9	480	2,306	0.024	(0.024)	0.37	0.022	(0.022)	0.33	0.000	(0.002)	0.04
School % FTC missing	2.1	884	4,309	0.050*	(0.021)	0.42	0.054**	(0.020)	0.38	-0.003	(0.003)	0.05

Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data, the Private School Survey (PSS), and the Florida Education Data Warehouse data.

Notes: ** p <0.01, * p <0.05, + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. Matching is conducted separately for each treatment subgroup. See table A.1 notes for other sample and specification details. The religiosity or denomination of each school is from the PSS, with missing values filled in using a survey of Florida private schools. The PSS is administered every other year, so we carry forward missing religiosity or denomination values from the prior year (and from the next year if the prior year is missing). The share of FTC students in each school is calculated using total FTC enrollment from Step Up for Students of the school in the first year the FTC student enrolled, divided by total enrollment in that year from the PSS (with enrollment in non-PSS years imputed as the average of the adjacent years).

TABLE A.10

Enrollment at Florida Public College within Two Years of Expected High School Graduation, by Baseline Grade and Year

	Baseline Grade							
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**
FTC (0/1)	0.058**	0.053*	0.085**	0.068**	0.043**	0.074**	0.054**	0.037+
	(0.022)	(0.021)	(0.014)	(0.014)	(0.015)	(0.013)	(0.019)	(0.021)
Control mean	0.355	0.400	0.400	0.384	0.375	0.411	0.400	0.444
Average dosage	3.5	3.2	3.0	2.5	2.2	2.4	2.0	1.6
Observations	3,930	5,044	9,822	9,574	9,355	10,214	6,960	4,928

	Baseline Year						
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
FTC (0/1)	0.076**	0.061**	0.079**	0.058**	0.054**	0.061**	0.037+
	(0.021)	(0.013)	(0.015)	(0.013)	(0.014)	(0.018)	(0.020)
Control mean	0.414	0.392	0.392	0.398	0.389	0.401	0.403
Average dosage	3.0	2.9	2.5	2.4	2.2	2.2	2.1
Observations	4,773	13,113	11,529	11,001	8,506	6,276	4,633

Source: Authors' calculations from Step Up for Students' Florida Tax Credit (FTC) program data and Florida Education Data Warehouse data.

Notes: ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. See table A.1 notes for sample and specification details.

TABLE A.11

Robustness Checks (Specification and Sample Changes), Effect of FTC Participation on Enrollment at Florida Public College within Two Years of Expected High School Graduation

	Estimate	Std. error	Obs.
Baseline grades 3–7			
1. Primary estimate	0.064**	(0.007)	37,739
2. Nearest neighbor matching (*N* = 1), by school/year	0.064**	(0.009)	12,888
3. Nearest neighbor matching (*N* = 5), not by school/year	0.068**	(0.008)	37,450
4. No controls	0.059**	(0.007)	37,739
5. No matching	0.060**	(0.007)	544,102
6. Drop northern Florida counties	0.059**	(0.009)	28,190
7. No matching, students treated later are included in control group	0.059**	(0.007)	555,025
8. Drop control students not tested in public schools in first year after baseline	0.060**	(0.007)	35,730
9. No matching, non-FRPL included in control group	0.045**	(0.007)	928,185
Baseline grades 8–10			
1. Primary estimate	0.060**	(0.010)	22,107
2. Nearest neighbor matching (*N* = 1), by school/year	0.056**	(0.012)	7,564
3. Nearest neighbor matching (*N* = 5), not by school/year	0.064**	(0.010)	22,261
4. No controls	0.058**	(0.010)	22,107
5. No matching	0.067**	(0.010)	512,646
6. Drop northern Florida counties	0.068**	(0.012)	16,881
7. No matching, students treated later are included in control group	0.066**	(0.010)	519,705
8. Drop control students not tested in public schools in first year after baseline	0.049**	(0.011)	16,299
9. No matching, non-FRPL included in control group	0.051**	(0.010)	1,060,059

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: FRPL = free and reduced-price lunch; FTC = Florida Tax Credit. ** p <0.01; * p <0.05; + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. All models are based on nearest neighbor matching (*N* = 5) with exact matching on baseline school, grade, and year and are adjusted via probit regression using the list of control variables in the table A.1 notes, unless otherwise indicated.

TABLE A.12

Robustness Checks (Prebaseline Controls), Effect of FTC Participation on Enrollment at Florida Public College within Two Years of Expected High School Graduation

	Estimate	Std. error	Obs.
Baseline grades 3–7			
Primary estimate	0.064**	(0.007)	37,739
Restrict sample	0.060**	(0.008)	31,394
Prebaseline FRPL	0.062**	(0.008)	31,394
Prebaseline test scores	0.061**	(0.008)	31,394
Prebaseline FRPL and scores	0.063**	(0.008)	31,394
Baseline grades 8–10			
Primary estimate	0.060**	(0.010)	22,107
Restrict sample	0.051**	(0.010)	20,097
Prebaseline FRPL	0.053**	(0.011)	20,097
Prebaseline test scores	0.051**	(0.010)	20,097
Prebaseline FRPL and scores	0.053**	(0.011)	20,097

Source: Authors' calculations from Step Up for Students' Florida Tax Credit program data and Florida Education Data Warehouse data.

Notes: FRPL = free and reduced-price lunch; FTC = Florida Tax Credit. ** p <0.01, * p <0.05, + p <0.1. Robust standard errors adjusted for clustering on baseline school appear in parentheses. See table A.1 notes for sample and specification details. Restricted sample includes students with observed FRPL participation and test scores in the year before baseline.

Notes

1. A recent evaluation of the Washington, DC, voucher program found negative effects on test scores but only included data on the first year of student participation (Dynarski et al. 2017).
2. Some studies on the effects of charter schools on educational attainment suggest larger impacts on long-term outcomes than on test scores. Booker and coauthors (2014) report large positive effects of attending a charter high school in Chicago or Florida on high school graduation, college enrollment and persistence, and earnings, despite that these high schools not having large impacts on students' test scores. But other studies find effects on both test performance and college enrollment, such as Angrist and coauthors' (2016) study of Boston charter schools, which increase students' state test scores, SAT scores, and Advanced Placement scores and shift students from two-year to four-year institutions.
3. "Basic Program Facts about the Florida Tax Credit Scholarship (FTC)," Step Up for Children, accessed September 14, 2017, https://www.stepupforstudents.org/newsroom/basic-program-facts/.
4. Considerable growth in the program after 2009 has been fueled by including the alcoholic beverage excise tax as a source of tax credit funding. In recent years, most donations have resulted in credits to the alcoholic beverage excise tax (Step Up for Students 2016, 14).
5. Some FTC students are served by another SFO, AAA, which served 989 students (1 percent) in 2016–17.
6. Calculated from the Florida Private School Directory.
7. Charter school enrollment is from the Florida Department of Education. Public school enrollment is from Florida KIDS COUNT (see "Public School Student Enrollment," KIDS COUNT Data Center, accessed September 14, 2017, http://datacenter.kidscount.org/data/tables/5342-public-school-student-enrollment#detailed/2/any/false/1601,1526,1445,1250,1069/any/11865).
8. Specifically, beginning in 2006–07, students could continue in the program as long as their family income was below 200 percent of the federal poverty level (FPL)(see 2006-75 Fla. Laws 1–28). The eligibility threshold for continuation in the program was increased to 230 percent beginning in 2010–11, but if the student's household income was between 200 and 215 percent of the federal poverty level, their scholarship would be reduced by 25 percent, and if their income was between 215 and 230 percent, the scholarship would be reduced by 50 percent (see 2010-24 Fla. Laws 1–31). Since the 2016–17 school year, scholarships have been available to both new and continuing students up to 260 percent of the FPL. The scholarship amount would be reduced by 12 percent if the household income level was between 200 and 215 percent of the FPL; by 26 percent if between 215 and 230 percent of the FPL; by 40 percent if between 230 and 245 percent of the FPL; and by 50 percent if between 245 and 260 percent of the FPL (see 2014-184 Fla. Laws 1–82).
9. See 2014-184 Fla. Laws 1–82.
10. See 2012-22 Fla. Laws 1–7 and 2014-184 Fla. Laws 1–82.
11. Correspondence with EDW staff.
12. Very little data were collected and retained by the Florida Department of Education for the first two years of the program (2002–03 and 2003–04).
13. In most cases, the baseline grade is the grade before the first grade that a student participated in the FTC program. But in some cases (both treatment and control), students were held back so that the baseline grade is the same as the first grade that a student participated in the FTC program. Regardless of whether students were held back in subsequent years, the expected graduation year was determined using the baseline grade because decisions to hold students back should be understood as part of the treatment of attending a new school.

14. We also exclude a few potential treatment cohorts (which otherwise meet our criteria) after 2009–10 because the Florida Comprehensive Assessment Test was not consistently administered to high school students in both reading and math after that year.
15. Authors' calculations from the Florida private school directory and the total Florida school count.
16. Among students entering FTC in elementary or middle school, 36 percent participated for one year, 21 percent for two years, 14 percent for three years, and 29 percent for four or more years. Among students entering in high school, 39 percent participated for one year, 29 percent for two years, 18 percent for three years, and 14 percent for four or more years. These participation data may not represent consecutive years in the program. Students may be enrolled in the same private school in years that they do not receive FTC scholarships if, for example, they are no longer income eligible.
17. This still allows for an appropriate treatment-control comparison because all our analyses include fixed effects for the baseline grade and year.
18. The comparable statistic for all first-time, degree- or certificate-seeking undergraduate students is 74 percent. We thank our colleague Erica Blom for calculating these statistics from the fall 2014 Integrated Postsecondary Education Data System data.
19. Authors' calculations from the National Postsecondary Student Aid Study 2011–12 based on dependent students only. We identify which students are from families below 185 percent of the federal poverty level based on their household size and the published poverty levels for 2011. We obtain similar statistics for first-year students only and for students who were attending two-year institutions and above (i.e., excluding less-than-two-year institutions).
20. Because language spoken in the home and nativity are closely related, we fully interact the two variables in the model, which includes English-speaking foreign-born, Spanish-speaking foreign-born, other-language-speaking foreign-born, Spanish-speaking native-born, and other-language-speaking native-born students. English-speaking native-born students are the reference category.
21. We potentially include a few non-first-time FTC participants because we do not observe FTC participation in the first two years of the program (2002–03 and 2003–04). A student could have participated in 2002–03, returned to public school in 2003–04, and then be mislabeled by our analysis as a new participant in 2004–05.
22. We show below that our results are robust to including future FTC participants in the control group for earlier baseline grades and years.
23. Each treatment student only appears in a single baseline year-grade cohort, but comparison students can appear in multiple cohorts (e.g., in fourth grade in 2004–05 and fifth grade in 2005–06).
24. These results are available from the authors upon request.
25. The effects are similar for students who entered FTC in elementary or middle school and high school. Three- and four-year estimates, which are produced for a subset of students with outcomes observable for those periods, are available from the authors upon request.
26. The sample in appendix table A.4 is restricted to students who can be observed for at least four years after their expected high school graduation.
27. We find no impact of FTC participation on the attainment of vocational degrees, which are earned by no more than 1 percent of comparison group students in our study. These results are available from the authors upon request.
28. This pattern is the opposite of that found by Chingos and Peterson (2015), who report positive impacts for the children of US-born mothers but negative and statistically insignificant impacts for the children of foreign-born mothers.
29. See also Lueken (2016).

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